PACFISH Buffer and Temporary Road Monitoring and Miscellaneous Timber Sale Observations Report

Lochsa/Powell Districts
Nez Perce-Clearwater National Forests

December, 2016

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PACFISH Buffer Effectiveness Monitoring

Introduction

Timber harvest has the potential to cause hillslope erosion through soil disturbance from log yarding activities, the creation of openings which have greater exposure to surface erosion during spring melt runoff and through the removal of ground surface materials including large wood (Castelle and Johnson 2000). Broadcast burning after harvest also has the potential to reduce the amount of surface material (vegetation/wood) that could capture sediment moving down the slope. Sediment delivery to streams from harvest activities is a concern as it can affect the quality of fish habitat by embedding spawning gravels and winter habitat which can reduce the survival of fish species. Sediment in excess of natural conditions can also reduce the quantity and quality of habitat necessary to support aquatic invertebrates on which the fish feed.

The Interim Strategies for Managing Anadromous Fish-Producing Watersheds on Federal Lands in Eastern Oregon and Washington, Idaho, and Portions of California, also known as PACFISH, was a joint effort between the USDA Forest Service and USDI Bureau of Land Management to develop a strategy to assist in the protection and recovery of anadromous fish on federal lands in the Columbia River Basin and other watersheds on the West Coast. An environmental assessment was written and was followed by a decision notice that was signed in February, 1995. The assessment provided guidelines for the following federal land management activities: timber harvest, roads, grazing, recreation, minerals, fire/fuels, lands, general riparian area management, watershed and habitat restoration, and fisheries and wildlife restoration.

PACFISH identified riparian goals that establish an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. Since the quality of water and fish habitat in aquatic systems in inseparably related to the integrity of upland and riparian areas, several goals were developed. These include the maintenance or restoration of water quality, stream channel integrity and channel processes, instream flows, meadows and wetlands, diverse riparian plant communities, thermal regulation, natural rates of surface and streambank erosion and channel migration characteristics. These are expected to provide the riparian and aquatic habitats necessary to support native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities (PACFISH, pg. C-4).

The PACFISH Environmental Assessment identified interim Riparian Management Objectives (RMOs) which provide criteria against which land managers could assess current conditions in relation to desired conditions. The RMOs are the target toward which land managers can aim as they conduct resource management activities across the landscape. The RMOs must be met or exceeded before general habitat conditions would be considered good for anadromous fish. The goal of the RMOs is to achieve a high level of habitat diversity and complexity to meet the life history requirements of the fish community. The identified RMOs are pool frequency, water temperature, and width to depth ratios. Large woody debris is added for forested systems, and bank stability and lower bank angle are added for non-forested systems.

For forested systems, such as those that dominate the Lochsa District and other areas of the Nez Perce-Clearwater National Forests, streamside buffers (RHCAs) are the primary tool used to provide for the attainment of the RMOs during timber harvest activities. No harvest has occurred in the RHCAs since 1995 which provides for the maintenance of natural wood levels, natural channel migration and sediment levels, and riparian/aquatic thermal regimes. The widths of the buffers are 300’ on each side of fish bearing streams, 150’ feet on perennial non-fish bearing streams, 100’ on each side of intermittent streams and 50-100’ on field verified landslide prone areas.

No-harvest buffers of 100’ width adjacent to streams have been shown to be adequate in protecting the riparian vegetation necessary to maintain natural stream temperatures (Anderson and Poage 2014; Ott et al 2005; Lee et al 2004; Sridhar 2004; FEMAT 1993) and reduce sediment delivery to streams (Rashin et al 2006; Clinton 2011;

USDA 2006; Sweeney and Newbold 2014) associated with harvest activities. PACFISH RHCAs are expected to greatly reduce and/or prevent sediment delivery to streams from timber harvest units. The purpose of this monitoring was to locally verify the effectiveness of the RHCAs on Lochsa District streams.

Methods

Buffer Monitoring- 2014 and 2016

Regeneration (clearcuts with reserves) and intermediate (commercially thinned) timber harvest units were selected for monitoring with an emphasis on large unit size and the presence of streams. Units were located on gentle to moderate gradient slopes (13 to 47% with an average of about 35%). Monitoring occurred during the summer of 2014. In addition, monitoring of one private land and one Idaho Dept. of Lands post-fire harvest unit occurred in 2016 in the Lower Selway River between Swiftwater and Elk City Creeks. These fire salvage activities were conducted in 2015 as a result of the 2014 Johnson Bar Fire.

A total of 13 regeneration harvest units totaling 242 acres and 4 commercial thin units totaling 170 acres were monitored (Appendix A and B). The regeneration harvest units were assumed to be the most likely to generate sediment due to the removal of the majority of trees (up to 85%) and the creation of larger openings that are exposed to rain and snow runoff and potentially more erosion. Commercial thin units typically remove up to 60% of the trees which provides for more canopy cover and snow/rain interception. These are expected to have a lower risk of surface erosion as a result. Yarding methods within the units included ground-based tractor (9%), skyline (27%) or a mix of the two (64%). Ground-based yarding is expected to create the most erosion because it disturbs more soil than skyline yarding systems; however, ground-based systems are limited to slopes less than 35% in order to minimize the risk. The private and state land fire salvage units were regeneration harvested and retained streamside buffers of 75' to 150'. These are greater than the 50' required by the Idaho Forest Practices Act for fish-bearing streams.

Monitoring was conducted after site preparation burning activities were completed since burning has the potential to remove duff and ground based wood/slash that typically traps sediment. Broadcast burning (burning the entire unit) was conducted on 9 regeneration harvest units and pile burning (burning only concentrated piles of slash) occurred on 4 units. No burning was conducted on the commercially thinned units. Burning occurred from 1 to 5 years after harvest activities were complete.
For the surveys, the perimeter of each harvest unit was walked in its entirety and the total length of survey was recorded. Surveyors looked for evidence of rill erosion and sediment tracks moving from the harvested/burned unit into areas outside of the unit, including RHCAs. The following information was collected for any sediment movement observed coming from the unit: GPS waypoint, causal mechanism (landslide/slump/rill erosion/other), length, width and average depth of the sediment track, distance from edge of buffer to lower end of sediment track, whether the sediment track reached a stream, and if so, the width and depth of track at stream bank edge.

Walk Through Surveys- 2004 through 2013

Walk through surveys of at least 14 units since 2004 within and around the perimeter of harvested and burned units. Participation in many of these reviews included the District's planning team as well as Forest level biologists, hydrologists, soils scientists, foresters, and line officers. Others I conducted alone or with the District Hydrologist. A variety of units were reviewed including those associated with fire salvage, bug kill salvage, commercial thinning and regeneration harvest. Visual observations were made regarding hillslope erosion and potential sediment delivery to streams.

Results

PACFISH Buffer Monitoring

A total of 28.4 miles of harvest unit boundaries were surveyed. RHCA's accounted for a total of 13.4 miles and averaged 47% of the unit perimeter (range 0-74%). Table 1 below summarizes the miles by harvest and burn treatment type and the estimated amount of the survey associated with PACFISH buffers. The remaining 15 miles were associated with ridgetop or other features where unit boundaries ended. Detailed survey information can be found in Table 1 of Appendix A and maps of surveyed units can be found in Appendix B.

Table 1. Miles of harvest units surveyed by harvest type and burn treatment.

Harvest Type	**Perimeter (miles)**		**Hillslope Gradient (%)**	
	Total Miles Surveyed	Estimated RHCA-Associated	Average	Range
Regeneration				
With broadcast burning	16.8	7.9	30	20-47
With pile burning	3.5	2.0	31	13-40
Commercial Thin	8.1	3.5	37	27-47
Total	28.4	13.4		

Surveys found no evidence of sediment moving from harvest units into PACFISH buffers or into project areas streams. It was also noted that hand firelines constructed around units typically formed a small cup-like trench that would catch sediment if it were to be delivered from the harvested hillslope. No erosion or sediment deposits from the hillslopes were observed in the firelines.

Walk Through Surveys

Walk through surveys found no evidence of sediment delivery into RHCAs or streams from harvested and burned units. Very little evidence of erosion was noted within the units due to the low to moderate severity burns which retained the duff and absorbing capabilities of the soil. The abundant ground-based woody material and resprouting vegetation also prevented erosion and downslope sediment movement. See Photos 1 through 17 below.

Knoll Creek Bugs Salvage Harvest (Lolo Creek)

- harvested in 2003, burned in 2004, reviewed in 2004.

Photo 1. Knoll Creek Bugs Unit 6- RHCA on downhill edge of unit

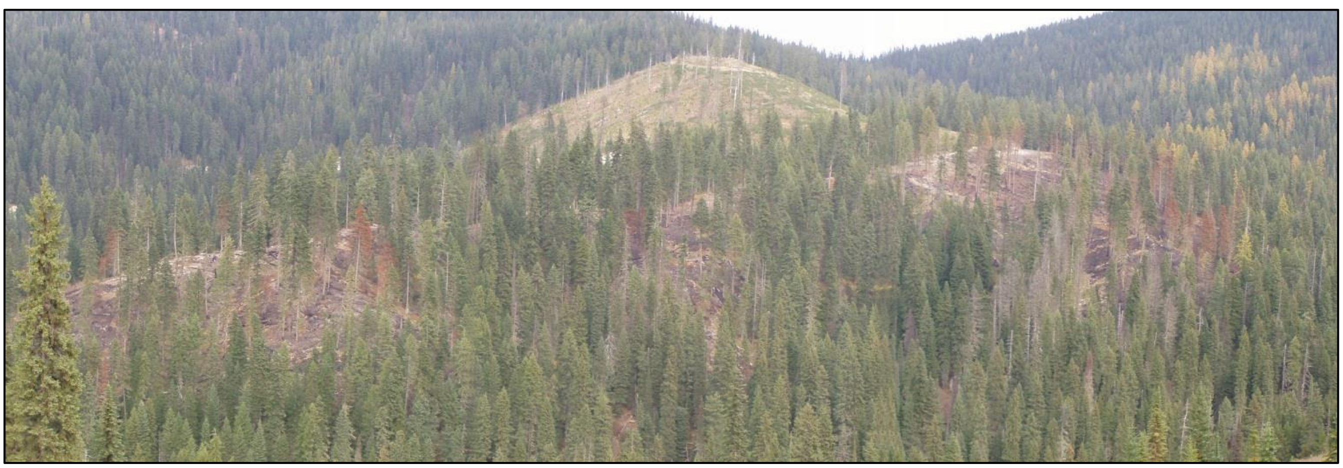


Photo 2. Knoll Creek Bugs Unit 6 with RHCAs evident.

Wendover Fire Salvage (Wendover Creek, Powell District)

- Fire in 2003, harvested in 2004, reviewed in 2005- no prescribed fire was used

Photo 3. Unit 1 post-harvest.

Photo 4. Unit 3 post-harvest

Where's Walde Commercial Thin (Pete King Creek)- harvested in 2011, reviewed in 2013

Photo 5. Commercial thin unit.

Austin Commercial Thin (Lolo Creek)- harvested in 2007, reviewed in 2008

Photo 6. Post-harvest. Tractor yarding occurred over snow during winter.

Charlie Commercial Thinning (North Fork Clearwater)- harvested in 2007, reviewed in 2008

Photo 7. Thinned area

Photo 8. Nearby unthinned area

Beaver Triangle Regeneration Harvest- (Beaver Creek, Powell District)

- harvested in 2006, burned in 2008, reviewed in 2008

Photo 9. Beaver Triangle Unit 2

Photo 10. Beaver Triangle Unit 10

Photo 11. Beaver Triangle Unit 8

Brick Trout Regeneration Harvest (Lolo Creek)

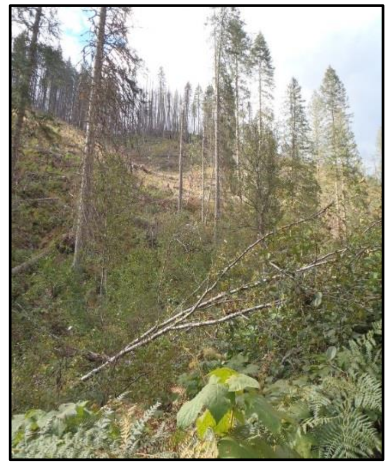
- harvested and burned in 2005, reviewed in 2006

Photo 12. Buffer on downhill edge of Unit 6, 2006.

Photo 13. Unit 6 in 2008, two years after review.

Private and Idaho Dept. of Lands Johnson Bar Fire Salvage (Lower Selway River)

-Harvest in 2015, reviewed in 2016.



Photos 14 and 15. IDL buffer on Burnt Creek (left) and private lands on Elk City Creek (right).

Photo 16. Abundant surface material after IDL harvest and burning, 2016

Photo 17. Google Earth view of streamside buffers on IDL and private lands.

Discussion

The presence of vegetation is known to reduce soil erosion caused by direct rainfall and overland flow (Litschert and MacDonald 2009; Sweeney and Newbold 2014; Waldron and Dakessian 1982). Soil properties that provide for vigorous plant growth are therefore essential in limiting surface erosion.

Soils across most of the District, and within the surveyed units, contain a layer of Mazama ash in varying thicknesses which provides for high water infiltration rates and very high moisture holding capacity. This results in well vegetated, highly productive soils that typically resist surface erosion.

No surface erosion was observed within any harvest unit and no sediment was delivered to RHCAs. There were no differences between salvage, regeneration and commercially thinned units. This is a result of local soil properties as well as the retention of much of the duff layer and woody surface material (both large and small) within the units. The naturally hummocky textured hillslopes created by grasses, forbs and shrubs also contributes to the lack of observed erosion. Broadcast burning appeared to be effective for planting site preparation without removing the larger (>3") surface material or causing mortality to well rooted shrubs and forbs. This has been consistently observed since 2004 (see Photos 1-17 above).

The RHCAs themselves are comprised of thick vegetation and downed woody material which act as a virtually impenetrable, filtering source for overland sediment flow (Photos 18 and 19). It is extremely unlikely that sediment would be delivered to streams through the RHCAs as a result. The results of this monitoring are consistent with local BMP monitoring on the Clearwater National Forest which has occurred since 1990. Between 1990 and 2008, the Forest had BMP implementation and effectiveness rates of 97% or greater (USDA, 2009). BMP audits on state and private forestry lands also had good results as well even though buffer widths were typically half or less the width of PACFISH RHCAs (Cristan et al 2014; Sugden et al 2012; Lakel 2010; Lee 2004).

Photo 18. RHCA interior (with fireline).

Photo 19. IDL buffer interior (Swiftwater Cr.).

PACFISH requires the buffering of verified landslide prone areas. Landslides are necessary for the development of aquatic habitat in that they can deposit large wood and gravel/cobble substrates to streams. These provide critical elements in the formation and maintenance habitat for all aquatic organisms (Luce et al 2012; Bisson et al 2009; Lassettre and Harris 2001). One landslide was observed during 2014 surveys and was associated with a previously stored road which was mostly recontoured (Photo 19). It was not used for the harvest activities and was not on a verified landslide prone area. The slide deposited sediment and some wood into the headwaters of Pete King Creek.

Photo 19. Previously stored road failure in Polar Ice Unit 8.

In summary PACFISH RHCA retention is effective at eliminating sediment delivery to streams from timber harvest activities on the Lochsa, Powell and Moose Creek Districts. This is due to the retention of surface woody material and vegetation with the harvested units and retention of all of the vegetation and wood within the RHCAs. I have found no evidence of sediment moving from harvest units into the RHCAs or into project area streams.

Further Monitoring: PACFISH RHCAs are effective during average precipitation years and have not been tested against large rain-on-snow or major flood events as they were not implemented prior to the last major event. Two storm events in the winter of 1995/1996 resulted in precipitation levels that were nearly 200% of normal and resulted in 907 landslides across the Clearwater National Forest (McClelland et al 1997). This landslide assessment found that 12% of the landslides were associated with timber harvest, 29% were natural and 58% were road related suggesting that timber harvest had limited effects on landslides even prior to PACFISH implementation. However, future monitoring should be conducted on a sample of PACFISH RHCAs in the event of a large event in order to further validate RHCA effectiveness.

In addition, temporary roads are being constructed on existing, non-system road templates where they exist. Monitoring should be conducted during log haul operations to determine if sediment contributions to streams are occurring. These roads generally do not have stream crossings; however, if they are not on or very near ridgetops, stream crossings with log or other culverts may exist.

Temporary Road Monitoring

Introduction

Roads are an important feature on the landscape in that they provide access into the Forest for a variety of activities including timber harvest, reforestation (tree planting), camping, hunting, fishing, OHV riding, hiking and other recreational activities. While roads provide these benefits, they also have the potential to contribute sediment to streams through drainage ditches that drain into live streams. Road locations near ridgetops or in areas with no stream crossings are preferred in order to eliminate delivery to streams. Forest roads fall into two categories: 1) permanent, and 2) temporary. The monitoring conducted for this report was focused only on temporary roads.

Temporary roads are short term in nature (in use for 1 to 2 years) and are built to provide access to timber sale harvest units. After completion of the harvest, the temporary roads are rehabilitated in order to reduce the impact on the disturbed soils and to prevent sediment from running off the road into the forest, the timber harvest unit, or the permanent road that the temporary road is connected to. There are several types of treatments that can be used to rehabilitate temporary roads: decompaction, recontouring, and water-barring. Temporary roads on the District are decompacted and woody material is placed on them in order to provide for soil nutrients and erosion control. Decompaction also provides suitable planting areas during reforestation efforts.

Methods

Temporary roads were walked and their total length was measured. Road locations (ridgetop or not) were noted. Hillslope gradients adjacent to roads constructed downhill from ridgetops were measured as were the steepest gradient section of the road itself. The condition of the road was also noted (recontoured or decompacted only and whether or not woody material was placed on the road). Any rill erosion was measured for length and whether or not sediment was delivered to streams.

Other observations of temporary roads have been made since 2004 during interdisciplinary team reviews of harvest operations.

Results

A total of 13 temporary roads totally 3.13 miles in length were surveyed (Appendix A, Table 2). Individual roads lengths ranged from 0.1 to 0.5 miles in length. One of the roads was decompacted and the remainder recontoured. A total of 5 roads had no woody material placed on them.

No erosion was observed on 12 of the 13 surveyed roads. Limited erosion was noted on one road (Yakus Unit 9, harvested in 2008) and none of the sediment was delivered to RHCAs or streams. The sediment was delivered into a roadside ditch where it was diverted through a cross drain culvert away from live water. The road was constructed on a side slope and was full recontoured; however, no woody material was placed on it as it was used as a fire break during broadcast burning activities. Rill erosion was noted on the road surface, some of which travelled down the slope and into the adjacent permanent road ditchline (Photos 20 and 21).

Photo 20. Temporary road, Yakus Unit 9, no wood.

Photo 21. Erosion on temporary road.

The following pictures (Photos 22 through 26) are of temporary roads taken during interdisciplinary team reviews or BMP audits.

Photo 22. Temporary road in used, winter 2009 (White White Unit 32).

Photo 23. Brick Trout Unit 6 temporary road, 2006.

Photo 24. Johnson Thin temporary road, 2010.

Photo 25. Polar Ice Unit 10 temporary road, 2013.

Photo 26. Saddle Camp temporary road, 2015.

Discussion

No sediment delivery to streams from temporary roads has been observed on the district due mostly to their location on or very near ridgetops with no stream crossings. While some erosion of the surface has been noted, delivery has not occurred. The recontouring or decompaction and addition of woody material on the road creates a bumpy texture that minimizes the concentration and movement of surface flow. The greatest risk of delivery is associated with areas where a temporary road could deliver sediment into an existing ditch adjacent to a permanent road. Delivery could occur if the ditch is connected to a live stream. This has not yet been observed but the potential likely exists.

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APPENDIX A- Survey Data

Table 1. PACFISH Buffer Survey Data

Surveys were conducted between June 30 and July 22, 2014.

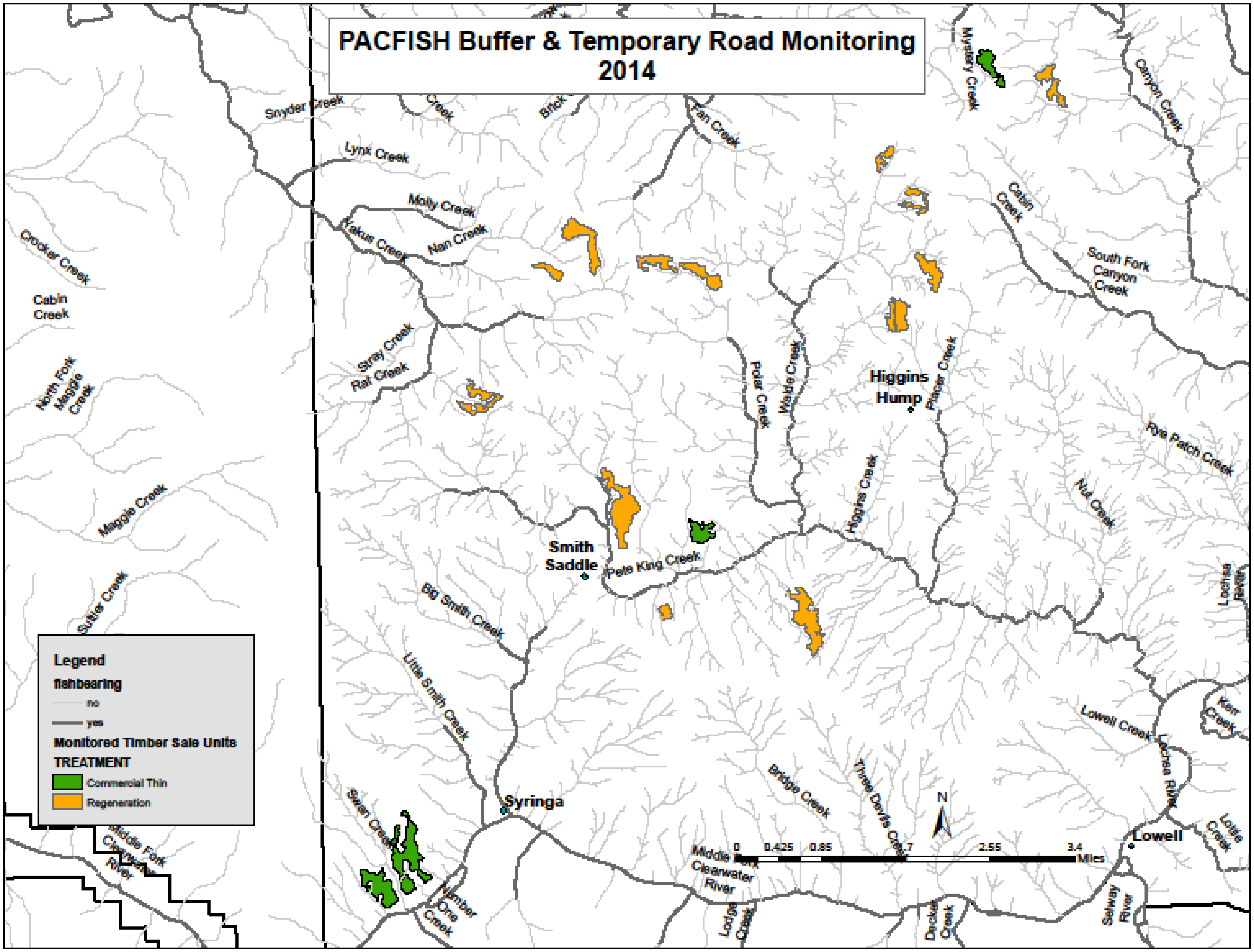
Sale Name	Unit #	Harvest Year	Acres	Treatment	Yarding Method	Burn Year	Burn Type	Total Perimeter Miles	Estimated RHCA Miles	% of Total in RHCAs
Yakus	7	2008	45	Regeneration	Skyline	2013	broadcast	1.9	0.7	37
Yakus	9	2008	13	Regeneration	Skyline	2013	broadcast	0.8	0.0	0
Yakus	20	2008	32	Regeneration	Skyline & Tractor	2013	broadcast	2.5	1.1	45
Polar Ice	14	2011	26	Regeneration	Skyline	2013	broadcast	1.2	0.5	40
Polar Ice	12	2012	23	Regeneration	Tractor	2013	broadcast	1.5	0.9	60
Polar Ice	9	2011	24	Commercial Thin	Skyline	2014	pile	1.2	0.9	74
Polar Ice	6	2011	10	Regeneration	Skyline	2014	broadcast	0.6	0.2	36
Polar Ice	4	2010	61	Regeneration	Skyline & Tractor	2014	broadcast	2.6	1.6	63
Polar Ice	8	2013	75	Regeneration	Skyline & Tractor	2014	broadcast	2.6	1.1	42
Interface Fuels 2	1D	2011	64	Commercial Thin	Skyline & Tractor	not	none	3.9	1.1	28
Interface Fuels 2	1C	2011	47	Commercial Thin	Skyline & Tractor	not	none	1.7	1.0	58
Where's Walde	38B	2008	16	Regeneration	Skyline & Tractor	2013	pile	1.7	1.1	64
Where's Walde	64	2008	24	Commercial Thin	Skyline	2013	pile	1.3	0.5	39
Where's Walde	65B	2008	27	Regeneration	Skyline & Tractor	2013	broadcast	1.9	1.0	53
Where's Walde	251	2008	10	Regeneration	Skyline	2013	pile	0.8	0.3	37
Where's Walde	38D	2008	12	Regeneration	Tractor	2013	pile	1.0	0.6	60
Where's Walde	253A	2008	28	Regeneration	Skyline & Tractor	2013	broadcast	1.4	0.8	59
							Total	28.4	13.4	47

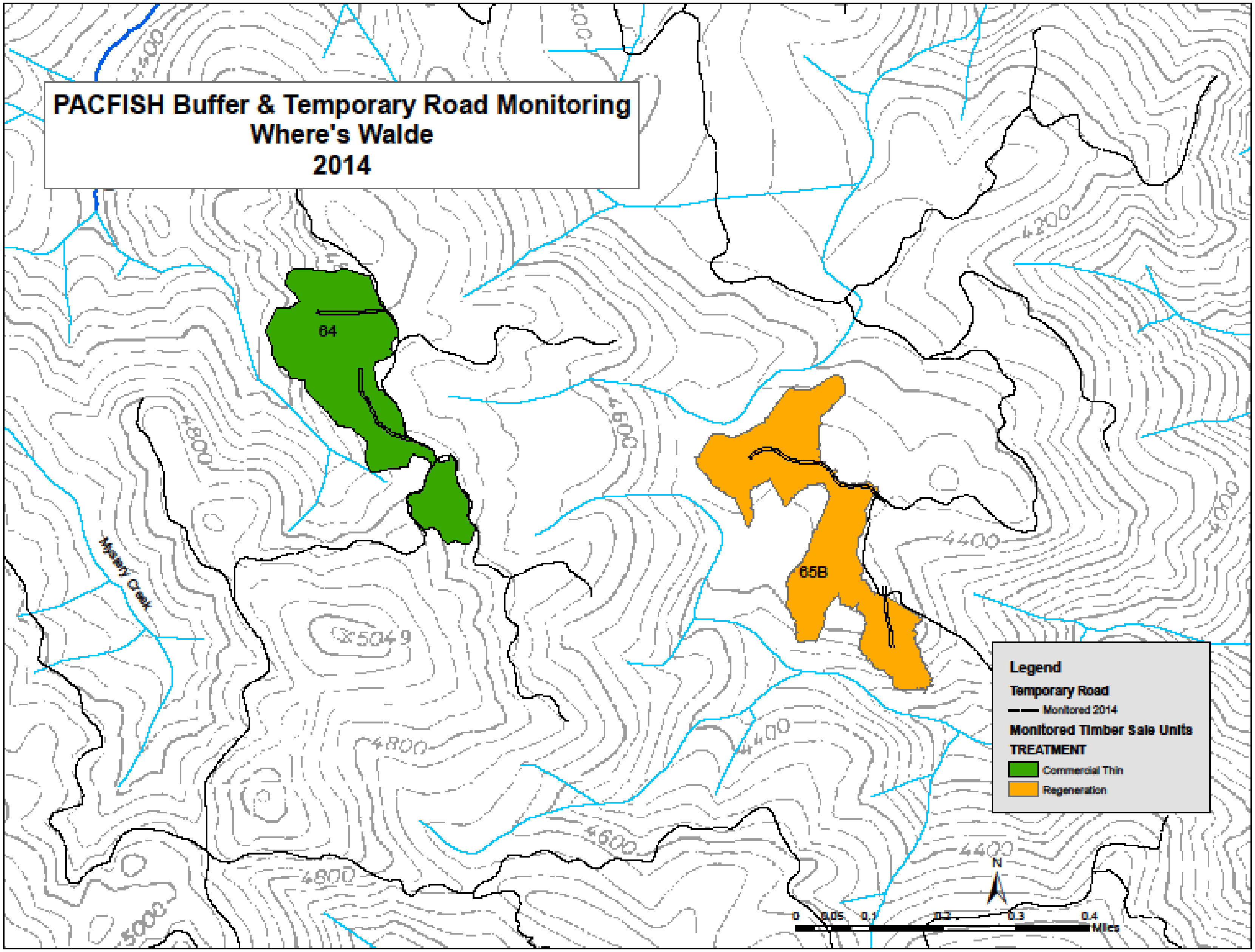
Table 2. Temporary Road Survey Data

Surveys were conducted between June 30 and July 22, 2014

Timber Sale Name	Unit #	Temp Road #	Ridgetop	Location Off Ridge (ft)	Steepest Slope of Road (%)	Steepest Slope of Hillside (%)	Road Condition	Wood on Top	Total Road Length (mi)	Measurable Erosion Detected	Comments
Yakus	7	1	no	140	15	18	Recontoured	yes	0.14	no	
Yakus	7	2	no	290	13	30	Recontoured	yes	0.3	no	
Yakus	9	1	no	123	25	25	Recontoured	yes	0.17	no	
Yakus	9	2	yes	0	20	30	Recontoured	no	0.25	no	
Yakus	9	3	no	95	35	50	Recontoured	no	0.11	yes	Sediment traveled 150' and entered the ditch which was not connected to a live stream- did not enter stream
Yakus	22	1	yes	0	10	5	Recontoured	yes	0.39	no	
Where's Walde	38D	1	no	600	5	3	Decompacted	no	0.11	no	
Where's Walde	253A	1	yes	0	20	30	Recontoured	no	0.51	no	
Where's Walde	296	1	yes	0	10	25	Recontoured	no	0.41	no	
Where's Walde	64	1	yes	0	20	5	Recontoured	yes	0.15	no	
Where's Walde	64	2	yes	0	20	5	Recontoured	yes	0.11	no	No erosion on temp road but main road 486-M has lots of erosion and needs to be fixed. Sediment not entering streams
Where's Walde	65B	1	yes	0	10	5	Recontoured	yes	0.16	no	No erosion on temp road but main road 5528-N has deep erosion and needs to be fixed. Sediment not entering streams
Where's Walde	65B	2	yes	0	30	10	Recontoured	yes	0.27	no	
							Total Miles Surveyed		3.08		

APPENDIX B- MAPS

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Where's Walde
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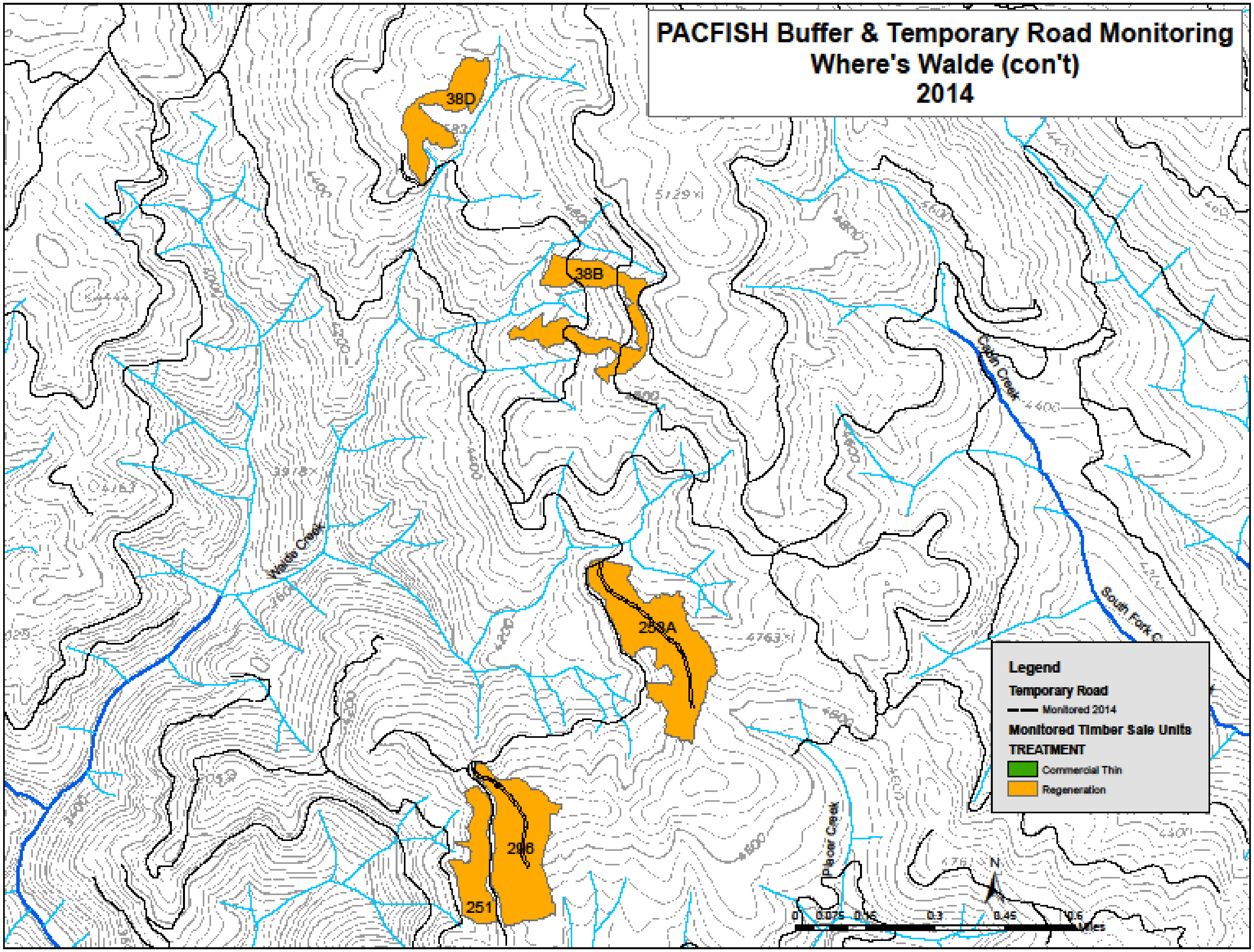
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Cabin Creek
South Fork C
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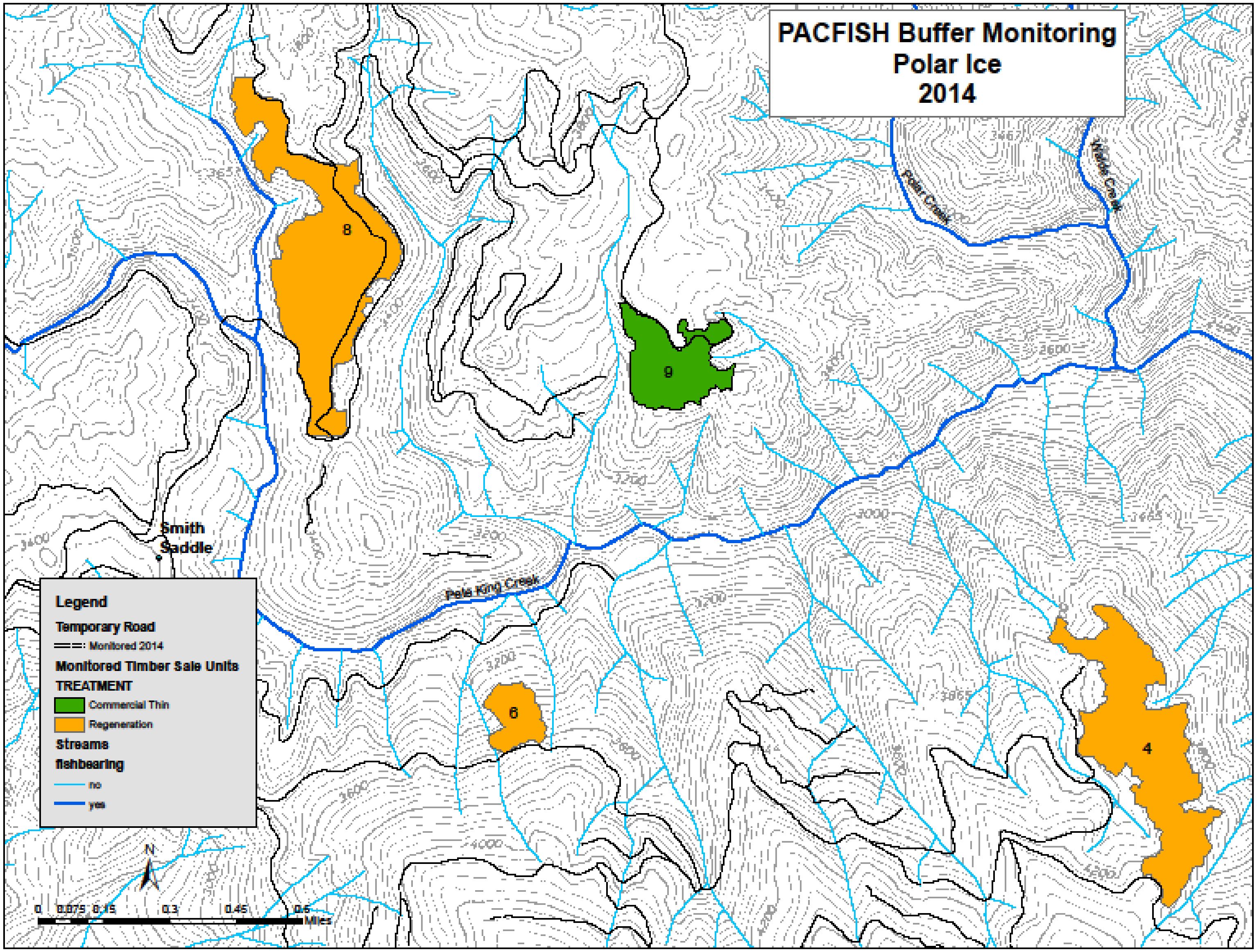
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Polar Ice
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Temporary Road
Monitored 2014
Monitored Timber Sale Units
TREATMENT
Commercial Thin
Regeneration
Streams
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Smith Saddle
Pete King Creek
Polar Creek
Walde Creek
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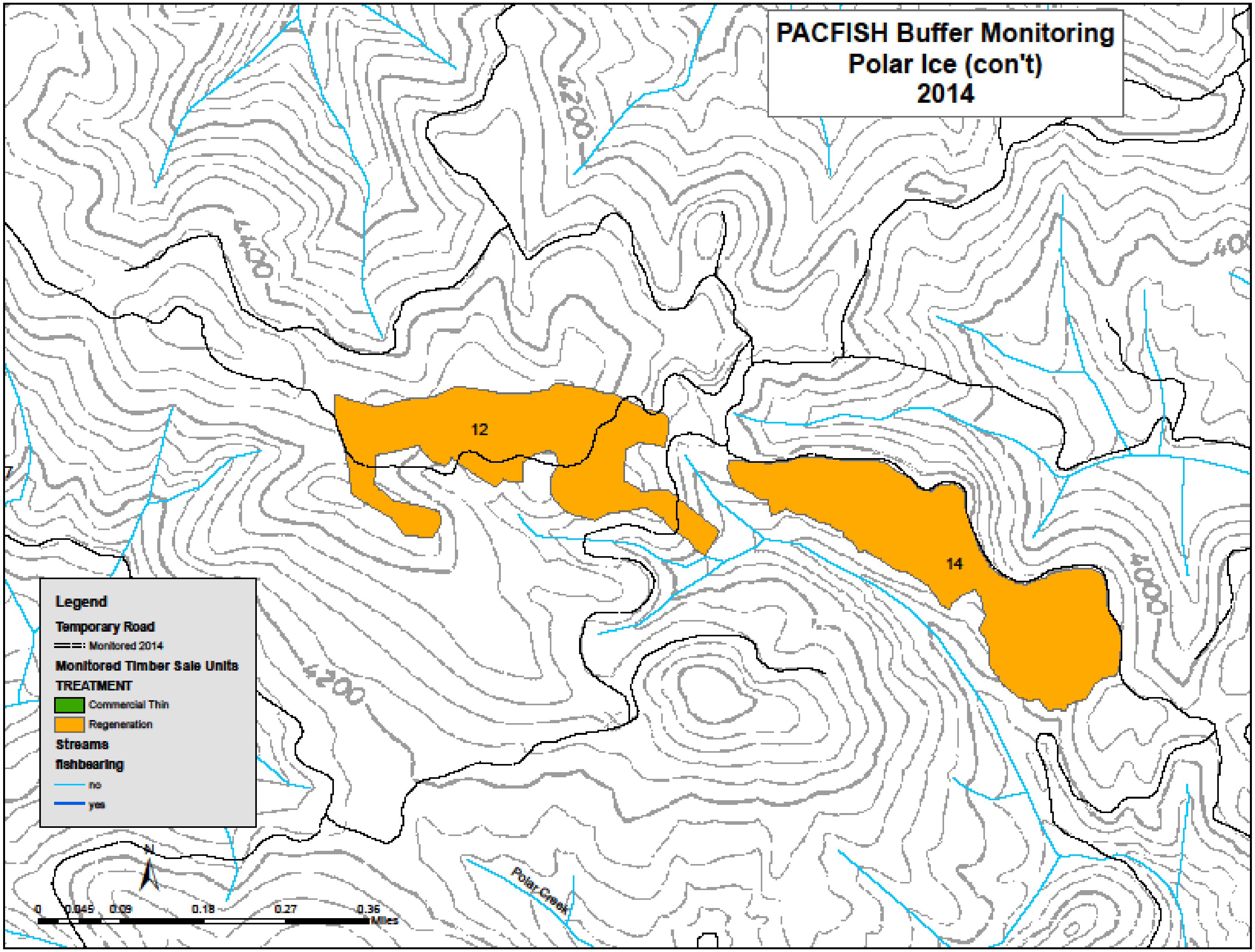
PACFISH Buffer Monitoring
Polar Ice (con't)
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Legend
Temporary Road
Monitored 2014
Monitored Timber Sale Units
TREATMENT
Commercial Thin
Regeneration
Streams
fishbearing
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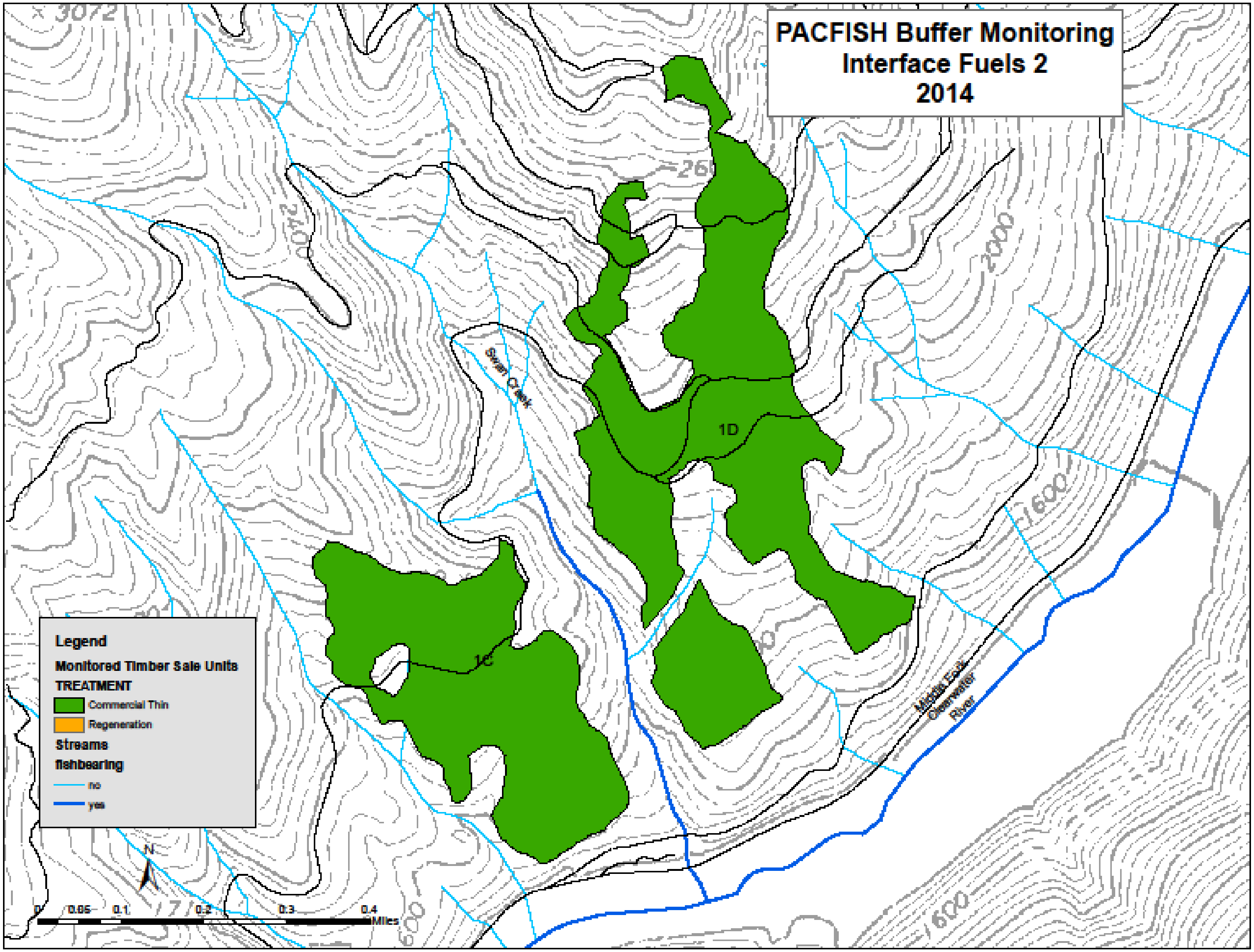
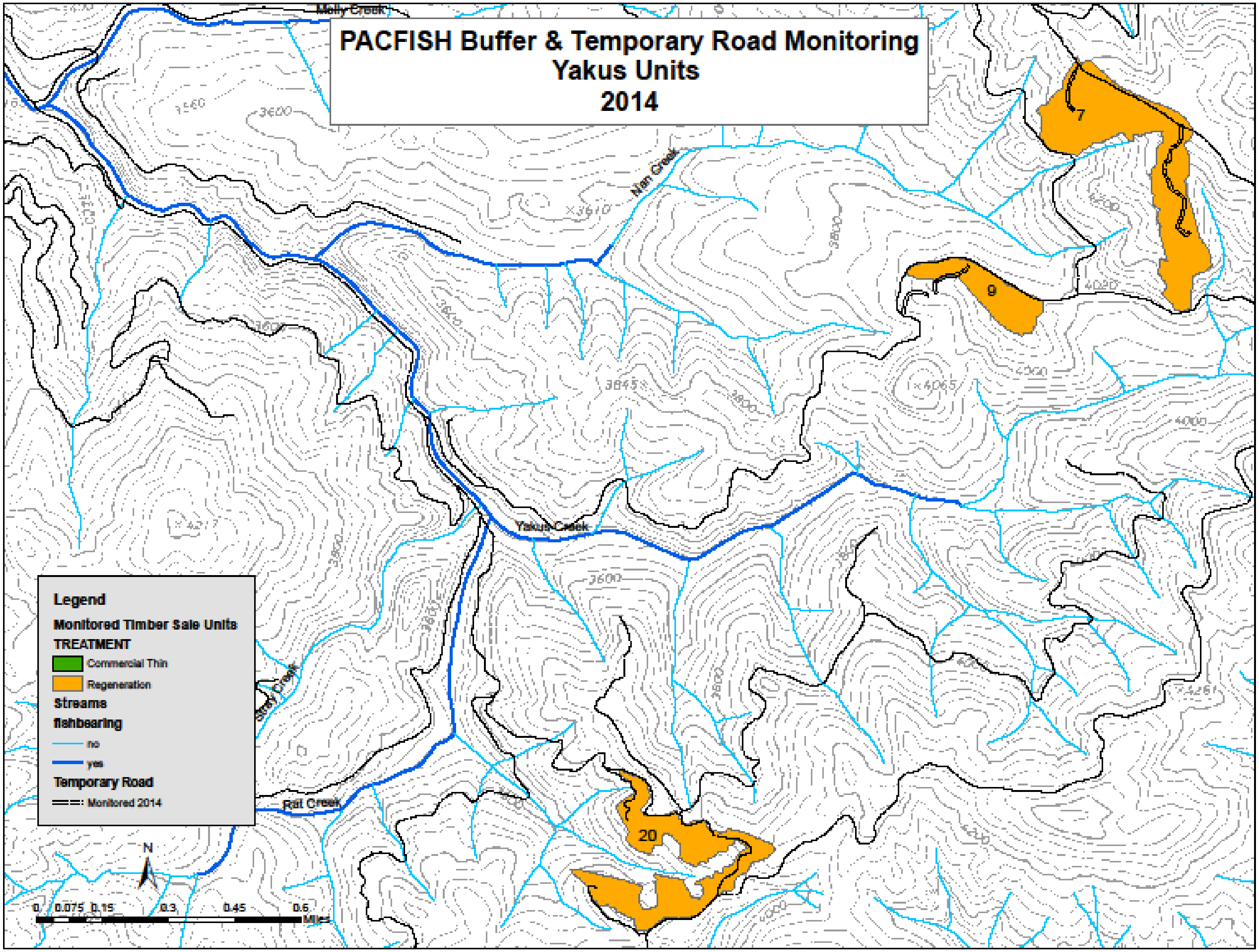
Miles


PACFISH Buffer Monitoring
Interface Fuels 2
2014
Legend
Monitored Timber Sale Units
TREATMENT
Commercial Thin
Regeneration
Streams
fishbearing
no
yes
1D
1C
Swan Creek
Middle Fork Clearwater River
2000
1600
2400
0 0.05 0.1 0.2 0.3 0.4
Miles
N


PACFISH Buffer & Temporary Road Monitoring
Yakus Units
2014
Molly Creek
Nan Creek
Yakus Creek
Rat Creek
Legend
Monitored Timber Sale Units
TREATMENT
Commercial Thin
Regeneration
Streams
fishbearing
no
yes
Temporary Road
Monitored 2014
7
9
20
N
0 0.075 0.15 0.3 0.45 0.6
Miles